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Associations of Self-Reported Cigarette Smoking with Chronic Obstructive Pulmonary Disease and Co-Morbid Chronic Conditions in the United States

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Abstract

Background—The question of how smoking, COPD, and other chronic diseases are related remains unresolved. Therefore, we examined relationships between smoking, COPD, and 10 other chronic diseases and assessed the prevalence of co-morbid chronic conditions among people with COPD.

Methods—We analyzed cross-sectional data from 405,856 US adults aged 18 years or older in the 2011 Behavioral Risk Factor Surveillance System. We used log-linear regression to estimate prevalence ratios (PRs) and their corresponding 95% confidence intervals (CIs) for these relationships adjusting for age, gender, race/ethnicity, marital status, educational attainment, annual household income, and health insurance coverage.

Results—Overall, 17.5% reported being current cigarette smokers, 6.9% reported having COPD, and 71.2% reported another chronic condition. After age-adjustment, prevalence of COPD was 14.1% (adjusted PR = 3.9; 95% CI: 3.7, 4.1) among current smokers and 7.1% (adjusted PR = 2.5; 95% CI: 2.4, 2.7) among former smokers compared to 2.9% among never smokers. The most common chronic conditions among current smokers after age-adjustment were high cholesterol (36.7%), high blood pressure (34.6%), arthritis (29.4%), depression (27.4%), and asthma (16.9%). In separate multivariable models, smoking and COPD were associated with each of the 10 other chronic conditions ($p < 0.05$), which also included cancer, coronary heart disease, diabetes, kidney disease, and stroke; COPD modified associations between smoking and co-morbidities, while smoking did not modify associations between COPD and co-morbidities.

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Declaration of Interest Statement

The authors have no conflicts of interest to report. The authors alone are responsible for the content and writing of the paper.

Conclusions—Our findings confirm previous evidence and highlight the continuing importance of comprehensive care coordination for people with COPD and co-morbid chronic conditions and also tobacco prevention and control strategies.

Keywords

COPD; chronic disease; cross-sectional studies; smoking; tobacco use

Introduction

COPD is a significant contributor to morbidity and mortality in the United States (US) (1). Previous epidemiologic studies suggest there are high frequencies of co-morbid chronic conditions among people with COPD (2–12). A recent analysis of the US National Health and Nutrition Examination Survey, for example, found that 96% of people aged 45 or older with a physician-diagnosis of chronic bronchitis or emphysema had at least one additional chronic condition (10).

Most previous studies have primarily focused on describing the prevalence of co-morbid chronic conditions among people with COPD and relevant outcomes, such as health-related quality of life, functional limitations, clinical outcomes, and mortality (2, 3, 6–12). Fewer studies, however, have assessed the role of potential shared determinants, such as cigarette smoking, that may link COPD and co-morbid conditions. Although the association between cigarette smoking with COPD and other chronic conditions is well-established, to date, few studies have examined the relationships between COPD and other chronic conditions by smoking status (13).

To better understand the relationship between smoking status and chronic conditions by COPD status and the relationship between COPD and other chronic conditions by smoking status, we used data from the 2011 Behavioral Risk Factor Surveillance System (BRFSS). The 2011 BRFSS provides an opportunity to estimate these relationships and to examine the prevalence of co-morbid chronic conditions among a large national sample of US adult respondents living with COPD.

Methods

Data source and sample

BRFSS (www.cdc.gov/brfss) is a state-based, random-digit-dialed telephone survey of noninstitutionalized, US adults aged 18 years or older, which is administered annually by state health departments with assistance from the US Center for Disease Control and Prevention (14). The 2011 BRFSS data used in this analysis reflect changes in weighting methodology (raking) and include both landline and cell phone respondents from the 50 states and the District of Columbia (DC) (14). BRFSS completes more than 400,000 adult interviews annually, making it the largest continuously conducted health survey system in the world. BRFSS includes questions on sociodemographic characteristics, chronic diseases, health behaviors, and access to health care. BRFSS estimates have been found to be reliable and valid (15).

Response rates and cooperation rates for BRFSS are calculated using standards set by the American Association of Public Opinion Research (www.aapor.org/standard_definitions2.htm) (16). The median response rate, which is defined as the number of respondents who completed the survey as a proportion of all eligible and likely eligible persons, for all states and DC was 49.7% and ranged from 33.8% to 64.1% in the 2011 survey (16). The median cooperation rate, which is defined as the number of completed interviews divided by the number of eligible respondents who were successfully reached by an interviewer, for all states and DC was 74.2% and ranged from 52.7% to 84.3% (16). Although low response and cooperation rates might result in non-response bias, raking in BRFSS serves a blanket adjustment for noncoverage and nonresponse and constrains the total number of cases to equal the population estimates (14). This study was exempt from human subjects review as the BRFSS data were publicly available. We analyzed available data from 405,856 respondents with complete data in 2011 for the study variables described next.

Measures

Current cigarette smokers were respondents who reported smoking at least 100 cigarettes during their lifetimes and reported smoking “every day” or “some days” at the time of the interview. Former smokers were those respondents who reported ever smoking at least 100 cigarettes but reported smoking “not at all” at the time of the interview. Never smokers were respondents who reported smoking fewer than 100 cigarettes during their lifetimes.

BRFSS 2011 was the first time the survey included a COPD specific question. COPD was identified among respondents who answered yes to the question “Has a doctor, nurse, or other health professional ever told you that you had . . . COPD, chronic obstructive pulmonary disease, emphysema, or chronic bronchitis?”

We included 10 chronic conditions other than COPD that were available in BRFSS and are similar to those identified for the list of multiple chronic conditions by a working group within the Department of Health and Human Services’ Office of the Assistant Secretary of Health (17). These include: arthritis, asthma, cancer, coronary artery disease, depression, diabetes, high blood pressure, high cholesterol, kidney disease, and stroke. Respondents were defined as having a given chronic condition if they responded affirmatively to questions with the same wording used for COPD for 10 other chronic conditions, “Has a doctor, nurse, or other health professional ever told you that you had . . .” followed by individual conditions including: arthritis (some form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia); asthma; cancer (other types of cancer excluding skin cancer); coronary heart disease (heart attack also called a myocardial infarction, angina, or coronary heart disease); depression (a depressive disorder including depression, major depression, dysthymia, or minor depression); diabetes (diabetes other than during pregnancy, pre-diabetes, or borderline diabetes); high blood pressure (high blood pressure other than during pregnancy, borderline high or pre-hypertensive); high blood cholesterol; kidney disease; or stroke.

Respondent characteristics that were assessed included: age group categorized using Age Distribution #8 (18–44, 45–54, 55–64, or ≥65 years) (18), gender (men or women), race/

ethnicity (non-Hispanic white; non-Hispanic black; non-Hispanic Asian; non-Hispanic Native Hawaiian or other Pacific Islander; non-Hispanic American Indian or Alaskan Native; non-Hispanic other race only; non-Hispanic multiracial; or Hispanic), marital status (married, previously married, or never married), educational attainment (did not graduate high school, graduated high school or completed the general educational development certificate, some college or technical school, or graduated college or technical school), annual household income (< $25 000, $25 000–$49 999, ≥$50 000, or missing), and health insurance coverage (yes or no).

Data analysis

All analyses were conducted using SAS-callable SUDAAN version 11.0 (Research Triangle Institute, Research Triangle Park, North Carolina) to account for the complex sampling design of BRFSS. All estimates were weighted to represent the sampled population. Results were considered significant at $p < 0.05$ with no adjustment for multiple testing. We examined selected characteristics and differences in these characteristics by cigarette smoking status and COPD status using Chi-square tests. Estimates for the prevalence ratio (PR) and the corresponding 95% confidence interval (CI) for the likelihood of having COPD or the other chronic conditions associated with smoking status, and for the likelihood of having chronic diseases associated with COPD after adjustment for selected characteristics were determined using log-linear regression models.

Log-linear regression models can be used to estimate relative risks for binary outcomes with data from cross-sectional studies (19). Adjusted regression models included the following relevant covariates that were expected to impact the dependent variables: age group, gender, race/ethnicity, marital status, educational attainment, annual household income, and health insurance coverage. We also tested for a statistical multiplicative interaction at $p < 0.05$ between cigarette smoking status and COPD on the relationship of either variable to each of the other chronic conditions and performed additional analyses stratified by COPD status and smoking status also using multivariable log-linear regression. In addition, we estimated the age-standardized prevalence of co-morbid chronic conditions using the projected year 2000 US population and compared groups defined by COPD status and smoking status (18); statistical significance was determined using *t*-tests.

Results

In this study population of 405 856 respondents aged ≥18 years, 6.9% reported having COPD, 54.7% had never smoked cigarettes, 27.8% were former smokers, 17.5% were current smokers, and 71.2% reported having at least one other chronic condition. The distributions of selected characteristics are presented by COPD and by smoking status (Table 1). Compared to respondents without self-reported COPD, respondents with COPD were significantly ($p < 0.001$) more likely to be aged 45–64 years or aged ≥65 years; to be women; to be non-Hispanic multiracial, non-Hispanic American Indian or Alaskan Native, or non-Hispanic white; to be previously married; to have lower educational attainment; to have a household income level < $25,000; to have each of the 10 chronic conditions; and to have a higher number of chronic conditions. Only 5.2% of 33 088 adults with COPD

reported having none of the 10 chronic conditions compared to 30.8% of adults without COPD ($p < 0.001$). Adults with COPD were less likely to be an Asian or to be Hispanic than persons without COPD ($p < 0.001$). Adults with COPD were also significantly more likely to be either a former smoker (39.3% vs. 27.0%, $p < 0.001$) or a current smoker (36.7% vs. 16.1%, $p < 0.001$) than adults without COPD.

Compared to respondents who reported being never cigarette smokers, current smokers were significantly ($p < 0.001$) more likely to be younger than age < 65 years; to be men; to be a non-Hispanic American Indian or Alaskan Native, non-Hispanic multiracial, or non-Hispanic black; to be never married or previously married; to have lower educational attainment; to have lower annual household income levels; to lack health insurance coverage; to have each of the chronic conditions; and to have a higher number of chronic conditions (Table 1). Current smokers were less likely than those who had never smoked to be Asian or Hispanic $p < 0.001$). Unlike the comparison between current smokers and never smokers, former smokers were significantly ($p < 0.001$) more likely than never smokers to be older, to be married, and to have health insurance coverage (Table 1). Compared to never smokers, former smokers were also significantly ($p < 0.001$) more likely to be men; to be non-Hispanic white, non-Hispanic American Indian or Alaska Native, or a non-Hispanic multiracial person; to have lower educational attainment; to have annual household income < $25,000; to have each of the 10 chronic conditions; and to have a higher number of chronic conditions.

The age-adjusted prevalence of COPD was 2.9% (95% CI: 2.7, 3.0) among never cigarette smokers, 7.1% (95% CI: 6.6, 7.6) among former smokers, and 14.1% (95% CI: 13.6, 14.7) among current smokers. After adjusting for age and other covariates in multivariable regression analyses, there was a greater likelihood of having COPD among current and former smokers compared to never smokers. In the analysis, the likelihood of having COPD was almost four times higher (PR = 3.9, 95% CI: 3.7, 4.1) among current smokers compared to never smokers. After adjustment for age, the most common conditions among current smokers were high cholesterol (36.7%), high blood pressure (34.6%), arthritis (29.4%), depression (27.4%), and asthma (16.9%); these were also the most common conditions among former smokers and never smokers (Figure 1).

There were significant interactions ($p < 0.001$) between smoking status and COPD for the associations with each of the chronic conditions. Table 2 shows the relationship of smoking status to each chronic disease stratified by COPD status. After taking into account all the covariates, current smoking was associated with a higher likelihood of arthritis, cancer, coronary heart disease, depression, and stroke than those who had never smoked among adults with no COPD. However, among adults with COPD, current smokers had a higher likelihood of only cancer and depression compared to those who had never smoked after taking into account the covariates.

The age-adjusted prevalence of each chronic condition was significantly ($p < 0.001$) higher among adults with COPD than among adults without COPD (Figure 2). The most common chronic conditions among adults with COPD were high cholesterol (49.3%), arthritis (48.8%), asthma (47.9%), high blood pressure (46.7%), and depression (42.0%). Because

there was a significant multiplicative interaction between COPD and smoking status for the associations with each chronic disease, Table 3 shows the multivariable regression analyses of the COPD-related likelihood of having the other chronic conditions for groups defined by smoking status. After adjustment for all covariates, adults with COPD had a significantly higher prevalence of each co-morbid condition, regardless of smoking status.

Additionally, Table 4 shows the multivariable regression analyses for the likelihood of having each of the other chronic diseases with all possible combinations of COPD and smoking status categories as a predictor (never smokers without COPD as the reference group). After adjustment for all covariates, current smokers with COPD had a significantly higher prevalence for most of the other chronic conditions in comparison to never smokers without COPD.

Discussion

This epidemiologic study confirms the relationship of smoking with COPD and expands on previous findings by relating both smoking and COPD with 10 other chronic diseases using the largest national US survey available. Current cigarette smokers reported approximately four times more COPD than never smokers and people who reported having COPD were significantly more likely to have each chronic condition than people who reported having no COPD. Interestingly, COPD appears to modify the relationship between smoking and the other chronic conditions. That is, the relationship between COPD and the other chronic conditions (e.g., arthritis, asthma, cancer, coronary artery disease, depression, diabetes, high blood pressure, high cholesterol, kidney disease, and stroke) persisted regardless of smoking status, while relationships of smoking with other chronic conditions (e.g., arthritis and coronary heart disease) differed between people with COPD and those without COPD.

Smoking is the leading preventable cause of COPD and several other chronic conditions, resulting in approximately one-half million deaths among adults and $289 billion in total economic costs annually in the US (20). Enhanced implementation of proven population-level interventions, including tobacco price increases, hard-hitting anti-tobacco mass media campaigns, comprehensive smoke-free laws, and barrier-free access to help quitting, is critical to decreasing smoking and reducing the health and economic burden of tobacco-related diseases, such as COPD (21, 22).

Our study confirms results from previous studies that observed a relatively high prevalence of co-morbid chronic conditions among people with COPD. In a study of 14 828 adults aged 45 years or older included in the National Health and Nutrition Examination Survey, 96% of people with COPD had at least one other co-morbid chronic condition, including 60% with high blood pressure, 55% with arthritis, and 48% with high cholesterol (10). In another study of 15,792 adults aged 45–64 years from the Atherosclerosis Risk in Communities Study and the Cardiovascular Health Study populations, the presence of respiratory impairment determined by lung function measurement and presence of respiratory symptoms were associated with increased risk of co-morbid high blood pressure, coronary artery disease, and diabetes, and increased risk of having at least two of these co-morbid chronic conditions (8). Additionally, in a study of 341,329 adults representative of the

Italian population aged 45 years or older, COPD was associated with several co-morbid chronic conditions, including coronary artery disease, depression, diabetes, and cancer (3).

Furthermore, our study indicates there was no difference in the likelihood of some common chronic conditions (e.g., arthritis and coronary heart disease) among never, former, and current smokers with COPD, while there was a difference in the likelihood of others (e.g., cancer and depression). For example, we observed a 20% increased likelihood of each of these conditions among current smokers with COPD compared to adults with COPD who never smoked. In a previous prospective study, smoking modified the relationship between COPD and subsequent onset of depression, resulting in an increased risk of depression among people with COPD who smoke (23).

Equally, there is likely an increased risk of cancer among people with COPD who smoke. Furthermore, the lack of differentiation among people with COPD by smoking status for the other eight co-morbid chronic conditions examined supports the notion that oxidative stress and systemic inflammation are common mechanisms. According to growing evidence, oxidative stress and systemic inflammation are implicated as common mechanisms in the development and progression of COPD and also high cholesterol, arthritis, asthma, and high blood pressure (4, 13, 24), which we observed to be the most common co-morbid chronic conditions among people with COPD in this study. Research that tracks changes in biomarkers of oxidative stress and systemic inflammation in relation to smoking, COPD, and other chronic diseases and considers potential gender differences is needed to provide further insights. Exploratory analyses revealed that women with COPD may carry a greater burden of co-morbid conditions in comparison to men with COPD. Nonetheless, the role of smoking and its implications with respect to COPD and co-morbid conditions call attention to the importance of comprehensive care coordination for both women and men with multiple chronic conditions and evidence-based tobacco prevention and control strategies.

The findings are subject to at least three limitations. First, the information on smoking, COPD, chronic conditions, and other variables were collected through self-report and were not validated by biomarkers or medical records and might be subject to recall and other response biases (25). Second, the cross-sectional study design does not permit determining temporal sequence of cigarette smoking, COPD, and other chronic conditions and thus cause and effect relationships cannot be determined. Third, this study only assessed cigarette smoking status and not dose-response relationships or other forms of combustible tobacco use.

Conclusion

In summary, current and former cigarette smokers were more likely than never smokers to have COPD and most of the other chronic diseases examined; these associations varied according to COPD status. Moreover, smoking status does not modify the prevalence of the co-morbidities examined among respondents with COPD. Enhanced efforts in the coordination of care for people with COPD and co-morbidities and also the implementation of evidence-based tobacco prevention and control strategies could be beneficial since several chronic diseases share a common mechanistic pathway.

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References

1. Ford ES, Croft JB, Mannino DM, Wheaton AG, Zhang X, Giles WH. COPD Surveillance-United States, 1999–2011. Chest. 2013 Jul 1; 144(1):284–305. [PubMed: 23619732]
2. Barr RG, Celli BR, Mannino DM, Petty T, Rennard SI, Sciurba FC, et al. Comorbidities, patient knowledge, and disease management in a national sample of patients with COPD. Ame J Med. 2009 Apr; 122(4):348–355.
3. Cazzola M, Bettoncelli G, Sessa E, Cricelli C, Biscione G. Prevalence of comorbidities in patients with chronic obstructive pulmonary disease. Respir Inter Rev Thorac Dis. 2010; 80(2):112–119.
4. Corsonello A, Antonelli Incalzi R, Pistelli R, Pedone C, Bustacchini S, Lattanzio F. Comorbidities of chronic obstructive pulmonary disease. Curr Opin Pulmon Med. 2011 Dec; 17(Suppl 1):S21–28.
5. Corsonello A, Pedone C, Incalzi RA. Comorbidities and risk assessment in chronic obstructive pulmonary disease. Am J Respir Crit Care Med. 2012 Oct 15.186(8):804. author reply 5. [PubMed: 23071190]
6. Divo M, Cote C, de Torres JP, Casanova C, Marin JM, Pinto-Plata V, Zulueta J, Cabrera C, Zagaceta J, Hunninghake G, Celli B. BODE Collaborative Group. Comorbidities and risk of mortality in patients with chronic obstructive pulmonary disease. Am J Respir Crit Care Med. 2012 Jul 15; 186(2):155–161. [PubMed: 22561964]
7. Antonelli Incalzi R, Fuso L, De Rosa M, Forastiere F, Rapiti E, Nardecchia B, Pistelli R. Co-morbidity contributes to predict mortality of patients with chronic obstructive pulmonary disease. Euro Respir J. 1997 Dec; 10(12):2794–2800.
8. Mannino DM, Thorn D, Swensen A, Holguin F. Prevalence and outcomes of diabetes, hypertension and cardiovascular disease in COPD. Euro Respir J. 2008 Oct; 32(4):962–969.
9. Putcha N, Puhan MA, Hansel NN, Drummond MB, Boyd CM. Impact of co-morbidities on self-rated health in self-reported COPD: An analysis of NHANES 2001–2008. COPD. 2013 Jun; 10(3): 324–332. [PubMed: 23713595]
10. Schnell K, Weiss CO, Lee T, Krishnan JA, Leff B, Wolff JL, Boyd C. The prevalence of clinically-relevant comorbid conditions in patients with physician-diagnosed COPD: a cross-sectional study using data from NHANES 1999–2008. BMC Pulmon Med. 2012; 12:26.
11. van Manen JG, Bindels PJ, CJIJ, van der Zee JS, Bottema BJ, Schade E. Prevalence of comorbidity in patients with a chronic airway obstruction and controls over the age of 40. J Clin Epidemiol. 2001 Mar; 54(3):287–293. [PubMed: 11223326]
12. Vanfleteren LEGW, Spruit MA, Groenen M, Gaffron S, van Empel VPM, Bruijnzeel PLB, et al. Clusters of comorbidities based on validated objective measurements and systemic inflammation in patients with chronic obstructive pulmonary disease. Am J Resp Crit Care. 2013 Apr 1; 187(7): 728–735.
13. US Department of Health and Human Services. [accessed 9 August 2013] How Tobacco Smoke Causes Disease: The Biology and Behavioral Basis for Smoking-Attributable Disease: A Report of the Surgeon General. 2010. Available from: http://www.surgeongeneral.gov/library/reports/tobaccosmoke/full_report.pdf
14. Centers for Disease Control and Prevention. Methodologic changes in the Behavioral Risk Factor Surveillance System in 2011 and potential effects on prevalence estimates. MMWR Morbid Mortal Week Rept. 2012 Jun 8; 61(22):410–413.
15. Fahimi M, Link M, Mokdad A, Schwartz DA, Levy P. Tracking chronic disease and risk behavior prevalence as survey participation declines: statistics from the behavioral risk factor surveillance system and other national surveys. Prevent Chron Dis. 2008 Jul.5(3):A80.
16. Centers for Disease Control and Prevention. Behavioral Risk Factor Surveillance System, 2011 Summary Data Quality Report. Centers for Disease Control and Prevention; Atlanta, GA:

17. Goodman RA, Posner SF, Huang ES, Parekh AK, Koh HK. Defining and measuring chronic conditions: imperatives for research, policy, program, and practice. Prevent Chron Dis. 2013; 10:E66.

18. Klein RJ, Schoenborn CA. Age adjustment using the 2000 projected U.S. population. Healthy People 2010 statistical notes: From the Centers for Disease Control and Prevention/National Center for Health Statistics. 2001 Jan.20:1–10.

19. Kleinman LC, Norton EC. What's the Risk? A simple approach for estimating adjusted risk measures from nonlinear models including logistic regression. Health Serv Res. 2009 Feb; 44(1): 288–302. [PubMed: 18793213]

20. US Department of Health and Human Services. [accessed 9 January 2014] The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General. 2014. Available from: http://www.surgeongeneral.gov/initiatives/tobacco

21. Centers for Disease Control and Prevention. Smoking-attributable mortality, years of potential life lost, and productivity losses–United States, 2000–2004. MMWR Morbid Mortal Week Rept. 2008 Nov 14; 57(45):1226–1228.

22. Centers for Disease Control and Prevention. Best practices for comprehensive tobacco control programs—2014. Atlanta, GA: US Department of Health and Human Services; 2014. Available from: http://www.cdc.gov/tobacco/stateandcommunity/best_practices/index.htm [accessed 18 June 2014]

23. Wagena EJ, van Amelsvoort LG, Kant I, Wouters EF. Chronic bronchitis, cigarette smoking, and the subsequent onset of depression and anxiety: results from a prospective population-based cohort study. Psychosom Med. 2005 Jul-Aug;67(4):656–660. [PubMed: 16046384]

24. Bauer CM, Morissette MC, Stampfli MR. The influence of cigarette smoking on viral infections: translating bench science to impact COPD pathogenesis and acute exacerbations of COPD clinically. Chest. 2013 Jan; 143(1):196–206. [PubMed: 23276842]

25. Szklo, M.; Nieto, FJ. Epidemiology: Beyond the Basics. 2. Sudbury, Mass: Jones and Bartlett Publishers; 2007. p. 117-118.

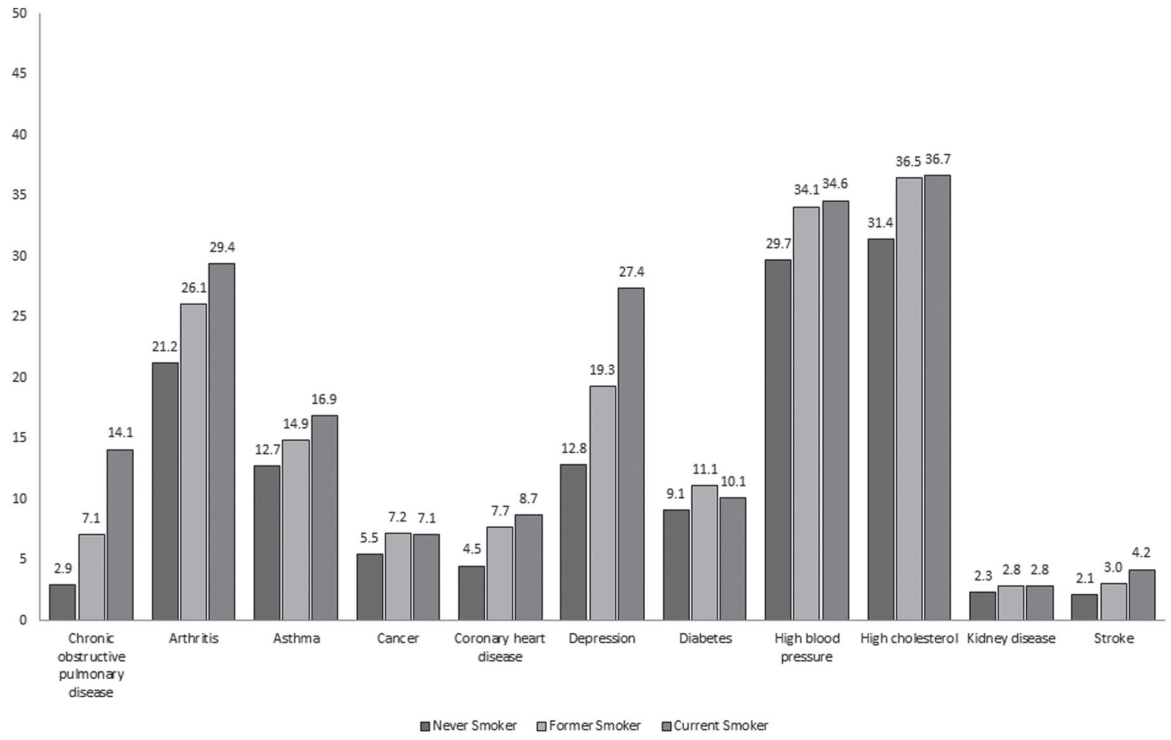

Figure 1.

Age-adjusted percentages of chronic conditions among adults aged ≥18 years, by cigarette smoking status: Behavioral Risk Factor Surveillance System, 2011.

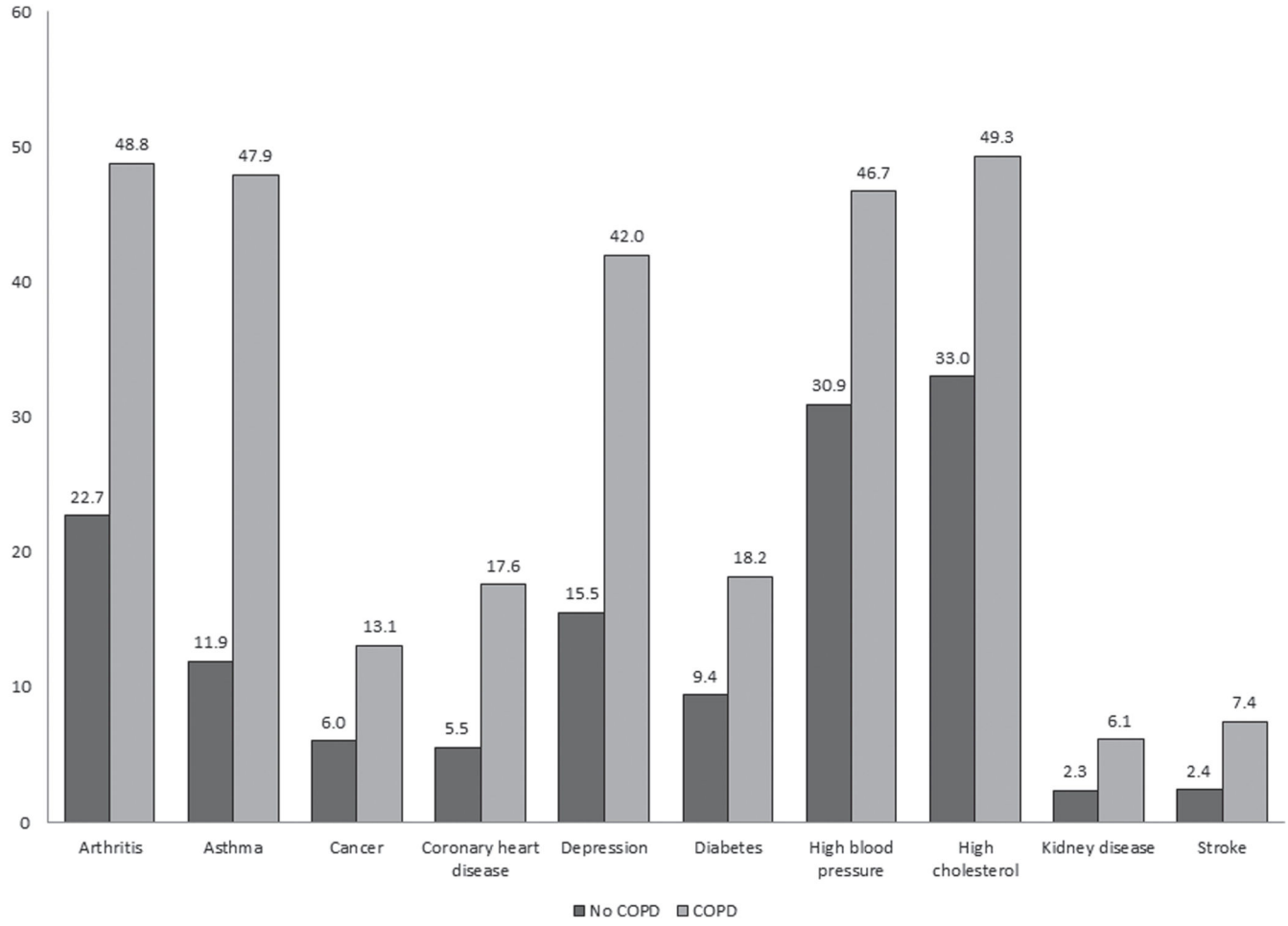

Figure 2.

Age-adjusted percentages of chronic conditions among adults aged ≥18 years, by chronic obstructive pulmonary disease (COPD) status: Behavioral Risk Factor Surveillance System, 2011.

Table 1

Distribution of selected characteristics among adults aged ≥ 18 years, by chronic obstructive pulmonary disease (COPD) status and cigarette smoking status: Behavioral Risk Factor Surveillance System, 2011

Characteristic	Number of Respondents	No COPD [N = 372,498] % (95% CI)	COPD [N = 33,088] % (95% CI)	Never Smoker[a] [N = 218,356] % (95% CI)	Former Smoker[b] [N = 126,784] % (95% CI)	Current Smoker[c] [N = 60,446] % (95% CI)
Age group, years[d,e]						
18–24	8,271	6.9 (6.6, 7.1)	3.0 (2.4, 3.7)	8.8 (8.5, 9.2)	1.6 (1.4, 1.9)	7.6 (7.0, 8.2)
25–44	79,574	33.2 (32.8, 33.5)	15.6 (14.6, 16.6)	35.3 (34.9, 35.8)	21.9 (21.4, 22.5)	37.4 (36.5, 38.2)
45–64	177,092	39.8 (39.5, 40.1)	44.4 (43.3, 45.5)	37.4 (37.0, 37.8)	42.7 (42.2, 43.3)	44.5 (43.7, 45.3)
≥65	140,649	20.1 (19.9, 20.3)	37.1 (36.1, 38.1)	18.4 (18.2, 18.7)	33.7 (33.2, 34.2)	10.5 (10.2, 10.9)
Gender[d,e]						
Men	155,240	47.6 (47.3, 47.9)	40.0 (38.9, 41.2)	41.9 (41.5, 42.4)	54.5 (54.0, 55.1)	51.3 (50.5, 52.1)
Women	250,346	52.4 (52.1, 52.7)	60.0 (58.8, 61.1)	58.1 (57.6, 58.5)	45.5 (44.9, 46.0)	48.7 (47.9, 49.5)
Race/ethnicity[d,e]						
White, non-Hispanic	326,032	69.4 (69.1, 69.7)	76.4 (75.3, 77.5)	65.7 (65.2, 66.1)	77.7 (77.1, 78.2)	70.7 (69.8, 71.5)
Black, non-Hispanic	32,004	11.1 (10.8, 11.3)	10.7 (9.9, 11.5)	12.1 (11.8, 12.5)	7.4 (7.0, 7.7)	13.4 (12.8, 14.0)
Asian	6,534	3.9 (3.7, 4.1)	1.1 (0.8, 1.4)	5.1 (4.9, 5.4)	2.2 (1.9, 2.4)	1.8 (1.5, 2.1)
Native Hawaiian or Pacific Islander	641	0.2 (0.2, 0.3)	0.2 (0.1, 0.4)	0.2 (0.2, 0.3)	0.2 (0.2, 0.3)	0.2 (0.1, 0.3)
American Indian or Alaskan Native	5,062	0.9 (0.9, 1.0)	1.7 (1.4, 2.0)	0.7 (0.7, 0.8)	1.1 (1.0, 1.2)	1.6 (1.4, 1.8)
Other race, non-Hispanic	2,154	0.4 (0.3, 0.4)	0.4 (0.2, 0.6)	0.4 (0.3, 0.4)	0.4 (0.3, 0.4)	0.4 (0.3, 0.5)
Multiracial, non-Hispanic	6,601	1.3 (1.2, 1.3)	2.6 (2.2, 3.0)	1.1 (1.0, 1.2)	1.4 (1.3, 1.6)	2.1 (1.9, 2.3)
Hispanic	26,558	12.8 (12.5, 13.1)	7.0 (6.3, 7.8)	14.6 (14.2, 14.9)	9.7 (9.3, 10.2)	9.8 (9.2, 10.4)
Marital status[d,e]						
Married	226,900	57.4 (57.0, 57.7)	45.2 (44.1, 46.3)	58.3 (57.8, 58.7)	62.4 (61.8, 62.9)	41.8 (41.0, 42.6)
Previously married[f]	124,897	20.3 (20.1, 20.5)	38.4 (37.4, 39.4)	17.9 (17.6, 18.2)	24.5 (24.1, 24.9)	28.2 (27.6, 28.9)
Never married[g]	52,789	22.3 (22.0, 22.7)	16.4 (15.4, 17.5)	23.8 (23.4, 24.2)	13.2 (12.7, 13.6)	30.0 (29.2, 30.8)
Educational attainment[d,e]						
Did not graduate high school	31,713	11.7 (11.4, 12.0)	23.0 (22.0, 24.1)	10.0 (9.7, 10.3)	13.1 (12.6, 13.6)	19.2 (18.4, 19.9)
Graduated high school	116,123	27.8 (27.5, 28.1)	34.3 (33.3, 35.4)	24.9 (24.5, 25.3)	30.0 (29.5, 30.5)	35.9 (35.2, 36.7)

Characteristic	Number of Respondents	No COPD [N = 372,498] % (95% CI)	COPD [N = 33,088] % (95% CI)	Never Smoker[a] [N = 218,356] % (95% CI)	Former Smoker[b] [N = 126,784] % (95% CI)	Current Smoker[c] [N = 60,446] % (95% CI)
Some college or technical school	109,389	30.1 (29.7, 30.4)	29.8 (28.8, 30.8)	29.0 (28.6, 29.5)	30.9 (30.4, 31.4)	31.8 (31.1, 32.6)
Graduated college or technical school	148,361	30.5 (30.2, 30.8)	12.8 (12.2, 13.4)	36.1 (35.7, 36.5)	26.1 (25.6, 26.5)	13.1 (12.6, 13.6)
Annual Household Income[d,e]						
<$25 000	99,613	22.7 (22.4, 23.0)	43.5 (42.4, 44.6)	21.1 (20.7, 21.5)	22.2 (21.8, 22.7)	36.6 (35.8, 37.4)
$25 000–$49 999	94,694	22.2 (21.9, 22.5)	23.4 (22.5, 24.4)	20.8 (20.5, 21.2)	23.9 (23.4, 24.3)	24.3 (23.6, 25.0)
≥$50 000	159,790	43.6 (43.3, 44.0)	20.5 (19.6, 21.4)	46.0 (45.6, 46.4)	42.8 (42.2, 43.3)	28.5 (27.8, 29.3)
Missing	51,489	11.5 (11.2, 11.7)	12.6 (11.9, 13.4)	12.1 (11.8, 12.3)	11.1 (10.8, 11.4)	10.6 (10.1, 11.1)
Health insurance coverage[e]	372,163	87.9 (87.6, 88.1)	87.5 (86.5, 88.3)	89.1 (88.8, 89.4)	91.2 (90.9, 91.6)	78.7 (77.9, 79.4)
Other chronic conditions						
Arthritis[d,e]	146,781	26.4 (26.1, 26.6)	59.2 (58.1, 60.3)	23.5 (23.1, 23.8)	37.1 (36.6, 37.6)	31.2 (30.5, 32.0)
Asthma[d,e]	51,877	11.2 (11.0, 11.4)	43.6 (42.5, 44.7)	12.4 (12.1, 12.7)	13.4 (13.0, 13.8)	16.5 (15.9, 17.2)
Cancer[d,e]	41,469	6.9 (6.8, 7.1)	15.9 (15.1, 16.6)	6.1 (5.9, 6.3)	10.8 (10.5, 11.1)	7.0 (6.6, 7.3)
Coronary heart disease[d,e]	40,071	4.3 (4.2, 4.4)	18.1 (17.3, 18.9)	3.4 (3.3, 3.6)	8.7 (8.4, 9.0)	5.5 (5.2, 5.8)
Depression[d,e]	74,234	15.7 (15.4, 15.9)	38.1 (37.0, 39.2)	13.1 (12.8, 13.4)	18.2 (17.8, 18.6)	28.3 (27.6, 29.0)
Diabetes[d,e]	55,227	10.9 (10.7, 11.1)	23.0 (22.1, 23.9)	10.0 (9.8, 10.3)	15.7 (15.3, 16.1)	10.7 (10.3, 11.2)
High blood pressure[d,e]	175,037	35.0 (34.7, 35.3)	58.1 (57.0, 59.2)	32.3 (31.9, 32.7)	45.6 (45.1, 46.1)	35.7 (35.0, 36.5)
High cholesterol[d,e]	175,875	36.8 (36.5, 37.1)	57.9 (56.8, 59.0)	33.8 (33.4, 34.2)	46.8 (46.3, 47.4)	38.7 (37.9, 39.5)
Kidney disease[d,e]	13,513	2.5 (2.4, 2.6)	7.3 (6.8, 7.9)	2.4 (2.3, 2.5)	3.7 (3.5, 3.9)	2.8 (2.6, 3.1)
Stroke[d,e]	17,362	2.8 (2.7, 2.9)	9.7 (9.2, 10.3)	2.3 (2.1, 2.4)	4.6 (4.4, 4.8)	4.2 (4.0, 4.5)
Number of chronic conditions[d,e]						
0	90,144	30.8 (30.5, 31.1)	5.2 (4.7, 5.8)	34.9 (34.5, 35.4)	19.7 (19.2, 20.2)	25.5 (24.8, 26.2)
1	95,683	26.4 (26.1, 26.7)	12.6 (11.8, 13.4)	26.7 (26.3. 27.1)	23.2 (22.7, 23.7)	25.1 (24.4, 25.8)
2	84,435	19.3 (19.0, 19.5)	17.7 (16.9, 18.6)	17.8 (17.5, 18.2)	21.5 (21.1, 22.0)	19.5 (18.9, 20.2)
3	63,927	12.6 (12.4, 12.8)	20.0 (19.2, 20.9)	11.0 (10.8, 11.2)	16.8 (16.4, 17.2)	14.1 (13.6, 14.6)
4	39,321	6.8 (6.6, 6.9)	18.6 (17.7, 19.4)	5.8 (5.6, 6.0)	10.4 (10.1, 10.7)	8.6 (8.2, 9.1)
5	19,735	2.9 (2.8, 3.0)	13.4 (12.7, 14.1)	2.5 (2.3, 2.6)	5.3 (5.1, 5.6)	4.4 (4.1, 4.7)
6	8,470	1.0 (0,9, 1.0)	7.5 (7.0, 8.1)	0.9 (0.9, 1.0)	2.1 (2.0, 2.3)	1.9 (1.7, 2.1)
7	2,840	0.3 (0.2, 0.3)	3.5 (3.2, 3.9)	0.3 (0.2, 0.3)	0.7 (0.6, 0.8)	0.7 (0.6, 0.8)

Characteristic	Number of Respondents	No COPD [N = 372,498] % (95% CI)	COPD [N = 33,088] % (95% CI)	Never Smoker[a] [N = 218,356] % (95% CI)	Former Smoker[b] [N = 126,784] % (95% CI)	Current Smoker[c] [N = 60,446] % (95% CI)
≥8	1,031	0.1 (0.1, 0.1)	1.4 (1.2, 1.6)	0.1 (0.1, 0.1)	0.2 (0.2, 0.3)	0.2 (0.2, 0,3)
Cigarette smoking[d]						
Never smoker[a]	218,356	57.0 (56.7, 57.3)	24.1 (23.2, 25.1)	–	–	–
Former smoker[b]	126,784	27.0 (26.7, 27.2)	39.2 (38.1, 40.2)	–	–	–
Current smoker[c]	60,446	16.0 (15.8, 16.3)	36.7 (35.6, 37.8)	–	–	–

[a] Respondents who smoked fewer than 100 cigarettes during their lifetime were considered never smokers.

[b] Respondents who smoked at least 100 cigarettes and reported smoking not at all at the time of interview were considered former smokers.

[c] Respondents who smoked at least 100 cigarettes and reported smoking every day or on some days at the time of interview were considered current smokers.

[d] Difference in distribution by COPD status determined to be statistically significant (chi-square p=0.05).

[e] Difference in distribution by smoking status determined to be statistically significant (chi-square p=0.05).

[f] Previously married includes those divorced, widowed, or separated.

[g] Never married includes those never married or members of unmarried couples.

Table 2

Relationship of cigarette smoking status to other chronic conditions among adults aged >18 years, by chronic obstructive pulmonary disease (COPD) status: Behavioral Risk Factor Surveillance System, 2011

	No COPD		COPD	
Chronic Disease	**Age-adjusted % (95% CI)**	**Multivariable PR (95% CI)[a]**	**Age-adjusted % (95% CI)**	**Multivariable PR (95% CI)[a]**
Arthritis				
Never Smoker[b]	20.5 (20.2, 20.8)	1.0 (referent)	45.0 (42.3, 47.8)	1.0 (referent)
Former Smoker[c]	24.5 (24.0, 25.1)	1.2 (1.2, 1.2)	51.0 (45.7, 56.3)	1.0 (1.0, 1.1)
Current Smoker[d]	26.1 (25.4, 26.8)	1.2 (1.2, 1.3)	50.8 (48.3, 53.2)	1.0 (1.0, 1.1)
Asthma				
Never Smoker[b]	11.5 (11.2, 11.9)	1.0 (referent)	52.3 (48.8, 55.8)	1.0 (referent)
Former Smoker[c]	12.5 (11.7, 13.3)	1.1 (1.1, 1.2)	51.8 (46.7, 56.9)	0.9 (0.8, 0.9)
Current Smoker[d]	12.6 (12.0, 13.4)	1.1 (1.0, 1.1)	44.3 (41.2, 47.4)	0.8 (0.8, 0.9)
Cancer				
Never Smoker[b]	5.4 (5.2, 5.6)	1.0 (referent)	11.1 (9.4, 13.1)	1.0 (referent)
Former Smoker[c]	6.8 (6.4, 7.2)	1.3 (1.2, 1.3)	13.4 (11.1, 16.0)	1.3 (1.2, 1.5)
Current Smoker[d]	6.0 (5.7, 6.4)	1.2 (1.1, 1.3)	13.8 (12.3, 15.5)	1.2 (1.1, 1.4)
Coronary heart disease				
Never Smoker[b]	4.2 (4.0, 4.3)	1.0 (referent)	14.6 (13.1,16.3)	1.0 (referent)
Former Smoker[c]	6.8 (6.5, 7.1)	1.4 (1.4, 1.5)	16.6 (14.8, 18.5)	1.1 (1.0, 1.2)
Current Smoker[d]	6.9 (6.5, 7.3)	1.4 (1.3, 1.5)	19.1 (17.2, 21.2)	1.0 (0.9, 1.2)
Depression				
Never Smoker[b]	12.2 (11.9, 12.6)	1.0 (referent)	34.3 (31.2, 37.5)	1.0 (referent)
Former Smoker[c]	18.0 (17.1, 18.9)	1.4 (1.3, 1.4)	39.4 (34.9, 44.2)	1.1 (1.0, 1.2)
Current Smoker[d]	24.3 (23.5, 25.1)	1.7 (1.6, 1.8)	49.2 (46.1, 52.2)	1.2 (1.1, 1.3)
Diabetes				
Never Smoker[b]	8.8 (8.6, 9.1)	1.0 (referent)	19.5 (17.0, 22.2)	1.0 (referent)
Former Smoker[c]	10.6 (10.2, 11.1)	1.2 (1.1, 1.2)	17.8 (15.7, 20.0)	1.0 (0.9, 1.1)
Current Smoker[d]	9.2 (8.7, 9.6)	0.9 (0.8, 0.9)	16.6 (15.0, 18.3)	0.8 (0.7, 0.9)
High blood pressure				
Never Smoker[b]	29.1 (28.9, 29.5)	1.0 (referent)	48.5 (45.1, 52.1)	1.0 (referent)
Former Smoker[c]	33.1 (32.4, 33.8)	1.1 (1.1, 1.1)	49.3 (43.3, 55.3)	1.0 (0.9, 1.0)
Current Smoker[d]	33.0 (32.1, 33.8)	1.0 (1.0, 1.0)	44.2 (41.8, 46.7)	0.9 (0.8, 0.9)
High cholesterol				
Never Smoker[b]	31.0 (30.7, 31.4)	1.0 (referent)	45.6 (42.3, 48.9)	1.0 (referent)
Former Smoker[c]	35.6 (34.9, 36.4)	1.1 (1.1, 1.2)	49.0 (42.9, 55.1)	1.1 (1.0, 1.1)
Current Smoker[d]	34.5 (33.8, 35.3)	1.1 (1.1, 1.1)	51.4 (48.4, 54.4)	1.1 (1.0, 1.1)

Chronic Disease	No COPD		COPD	
	Age-adjusted % (95% CI)	Multivariable PR (95% CI)[a]	Age-adjusted % (95% CI)	Multivariable PR (95% CI)[a]
Kidney disease				
Never Smoker[b]	2.1 (2.0, 2.3)	1.0 (referent)	6.3 (5.3, 7.5)	1.0 (referent)
Former Smoker[c]	2.5 (2.2, 2.8)	1.2 (1.1, 1.3)	7.6 (5.1, 11.0)	0.9 (0.8, 1.1)
Current Smoker[d]	2.4 (2.1, 2.6)	1.0 (0.9, 1.2)	5.6 (4.5, 6.8)	0.7 (0.6, 0.9)
Stroke				
Never Smoker[b]	1.9 (1.8, 2.0)	1.0 (referent)	6.4 (5.3, 7.7)	1.0 (referent)
Former Smoker[c]	2.7 (2.5, 2.9)	1.4 (1.3, 1.4)	6.1 (4.8, 7.7)	1.0 (0.9, 1.2)
Current Smoker[d]	3.3 (3.1, 3.6)	1.5 (1.3, 1.6)	8.9 (7.7, 10.3)	1.2 (1.0, 1.5)

[a] Prevalence ratio (PR) and 95% confidence interval (CI) obtained from separate multivariable log-linear regression models that included age, gender, race/ethnicity, marital status, educational attainment, household income, and health insurance coverage as covariates.

[b] Respondents who smoked fewer than 100 cigarettes during their lifetime were considered never smokers.

[c] Respondents who smoked at least 100 cigarettes and reported smoking not at all at the time of interview were considered former smokers.

[d] Respondents who smoked at least 100 cigarettes and reported smoking every day or on some days at the time of interview were considered current smokers.

Table 3

Relationship of chronic obstructive pulmonary disease (COPD) to other chronic conditions among adults aged >18 years, by cigarette smoking status: Behavioral Risk Factor Surveillance System, 2011

	Never Smoker[a]		Former Smoker[b]		Current Smoker[c]	
Chronic Disease	**Age-adjusted % (95% CI)**	**Multivariable PR (95% CI) [d]**	**Age-adjusted % (95% CI)**	**Multivariable PR (95% CI) [d]**	**Age-adjusted % (95% CI)**	**Multivariable PR (95% CI)[d]**
Arthritis						
No COPD	20.5 (20.2, 20.8)	1.0 (referent)	24.5 (24.0, 25.1)	1.0 (referent)	26.1 (25.4, 26.8)	1.0 (referent)
COPD	45.0 (42.3, 47.8)	1.7 (1.6, 1.8)	51.0 (45.7, 56.3)	1.3 (1.3, 1.4)	50.8 (48.3, 53.2)	1.6 (1.5, 1.7)
Asthma						
No COPD	11.5 (11.2, 11.9)	1.0 (referent)	12.5 (11.7, 13.3)	1.0 (referent)	12.6 (12.0, 13.4)	1.0 (referent)
COPD	52.3 (48.8, 55.8)	4.6 (4.3, 4.8)	51.8 (46.7, 56.9)	4.0 (3.8, 4.2)	44.3 (41.2, 47.4)	3.6 (3.3, 3.8)
Cancer						
No COPD	5.4 (5.2, 5.6)	1.0 (referent)	6.8 (6.4, 7.2)	1.0 (referent)	6.0 (5.7, 6.4)	1.0 (referent)
COPD	11.1 (9.4, 13.1)	1.5 (1.4, 1.7)	13.4 (11.1, 16.0)	1.3 (1.2, 1.4)	13.8 (12.3, 15.5)	1.8 (1.6, 2.0)
Coronary heart disease						
No COPD	4.2 (4.0, 4.3)	1.0 (referent)	6.8 (6.5, 7.1)	1.0 (referent)	6.9 (6.5, 7.3)	1.0 (referent)
COPD	14.6 (13.1, 16.3)	2.8 (2.6, 3.1)	16.6 (14.8, 18.5)	1.9 (1.8, 2.0)	19.1 (17.2, 21.2)	2.4 (2.2, 2.6)
Depression						
No COPD	12.2 (11.9, 12.6)	1.0 (referent)	18.0 (17.1, 18.9)	1.0 (referent)	24.3 (23.5, 25.1)	1.0 (referent)
COPD	34.3 (31.2, 37.5)	2.2 (2.1, 2.4)	39.4 (34.9, 44.2)	1.7 (1.6, 1.8)	49.2 (46.1, 52.2)	1.6 (1.6, 1.7)
Diabetes						
No COPD	8.8 (8.6, 9.1)	1.0 (referent)	10.6 (10.2, 11.1)	1.0 (referent)	9.2 (8.7, 9.6)	1.0 (referent)
COPD	19.5 (17.0, 22.2)	1.7 (1.5, 1.8)	17.8 (15.7, 20.0)	1.3 (1.2, 1.4)	16.6 (15.0, 18.3)	1.6 (1.5, 1.8)
High blood pressure						
No COPD	29.1 (28.8, 29.5)	1.0 (referent)	33.1 (32.4, 33.8)	1.0 (referent)	33.0 (32.1, 33.8)	1.0 (referent)
COPD	48.5 (45.1, 52.1)	1.4 (1.3, 1.4)	49.3 (43.3, 55.3)	1.2 (1.2, 1.2)	44.2 (41.8, 46.7)	1.3 (1.3, 1.4)
High cholesterol						
No COPD	31.0 (30.7, 31.4)	1.0 (referent)	35.6 (34.9, 36.4)	1.0 (referent)	34.5 (33.8, 35.3)	1.0 (referent)
COPD	45.6 (42.3, 48.9)	1.3 (1.3, 1.4)	49.0 (42.9, 55.1)	1.2 (1.1, 1.2)	51.4 (48.4, 54.4)	1.4 (1.3, 1.4)
Kidney disease						

Chronic Disease	Never Smoker[a]		Former Smoker[b]		Current Smoker[c]	
	Age-adjusted % (95% CI)	Multivariable PR (95% CI) [d]	Age-adjusted % (95% CI)	Multivariable PR (95% CI) [d]	Age-adjusted % (95% CI)	Multivariable PR (95% CI)[d]
No COPD	2.1 (2.0, 2.3)	1.0 (referent)	2.5 (2.8, 2.8)	1.0 (referent)	2.4 (2.1, 2.6)	1.0 (referent)
COPD	6.3 (5.3, 7.5)	2.4 (2.1, 2.8)	7.6 (5.1, 11.0)	2.0 (1.7, 2.2)	5.6 (4.5, 6.8)	1.8 (1.5, 2.2)
Stroke						
No COPD	1.9 (1.8, 2.0)	1.0 (referent)	2.7 (2.5, 2.9)	1.0 (referent)	3.3 (3.1, 3.6)	1.0 (referent)
COPD	6.4 (5.3, 7.7)	2.2 (1.9, 2.5)	6.1 (4.8, 7.7)	1.6 (1.5, 1.8)	8.9 (7.7, 10.3)	2.0 (1.8, 2.4)

[a] Respondents who smoked fewer than 100 cigarettes during their lifetime were considered never smokers.

[b] Respondents who smoked at least 100 cigarettes and reported smoking not at all at the time of interview were considered former smokers.

[c] Respondents who smoked at least 100 cigarettes and reported smoking every day or on some days at the time of interview were considered current smokers.

[d] Prevalence ratio (PR) and 95% confidence interval (CI) obtained from separate multivariable log-linear regression models that included age, gender, race/ethnicity, marital status, educational attainment, household income, and health insurance coverage as covariates.

Table 4

Relationship of all possible combinations of chronic obstructive pulmonary disease (COPD) and cigarette smoking status categories to other chronic conditions among adults aged ≥18 years: Behavioral Risk Factor Surveillance System, 2011

COPD × Smoking Status	Chronic Disease Multivariable PR (95% CI)[a]
	Arthritis
No COPD/Never Smoker[b]	1.0 (referent)
No COPD/Former Smoker[c]	1.2 (1.2, 1.2)
No COPD/Current Smoker[d]	1.2 (1.2, 1.2)
COPD/Never Smoker[b]	1.8 (1.7, 1.8)
COPD/Former Smoker[c]	1.6 (1.5, 1.6)
COPD/Current Smoker[d]	1.8 (1.7, 1.9)
	Asthma
No COPD/Never Smoker[b]	1.0 (referent)
No COPD/Former Smoker[c]	1.1 (1.0, 1.1)
No COPD/Current Smoker[d]	1.1 (1.0, 1.1)
COPD/Never Smoker[b]	4.5 (4.3, 4.8)
COPD/Former Smoker[c]	4.3 (4.1, 4.6)
COPD/Current Smoker[d]	3.7 (3.5, 3.9)
	Cancer
No COPD/Never Smoker[b]	1.0 (referent)
No COPD/Former Smoker[c]	1.3 (1.2, 1.4)
No COPD/Current Smoker[d]	1.1 (1.1, 1.2)
COPD/Never Smoker[b]	1.5 (1.4, 1.7)
COPD/Former Smoker[c]	1.7 (1.6, 1.8)
COPD/Current Smoker[d]	2.0 (1.8, 2.2)
	Coronary heart disease
No COPD/Never Smoker[b]	1.0 (referent)
No COPD/Former Smoker[c]	1.5 (1.4, 1.5)
No COPD/Current Smoker[d]	1.4 (1.3, 1.5)
COPD/Never Smoker[b]	3.0 (2.7, 3.3)
COPD/Former Smoker[c]	2.7 (2.5, 2.9)
COPD/Current Smoker[d]	3.1 (2.9, 3.4)
	Depression
No COPD/Never Smoker[b]	1.0 (referent)
No COPD/Former Smoker[c]	1.4 (1.3, 1.4)
No COPD/Current Smoker[d]	1.7 (1.6, 1.8)

COPD × Smoking Status	Chronic Disease Multivariable PR (95% CI)[a]
COPD/Never Smoker[b]	2.3 (2.1, 2.4)
COPD/Former Smoker[c]	2.3 (2.2, 2.4)
COPD/Current Smoker[d]	2.6 (2.5, 2.8)
	Diabetes
No COPD/Never Smoker[b]	1.0 (referent)
No COPD/Former Smoker[c]	1.2 (1.1, 1.2)
No COPD/Current Smoker[d]	0.9 (0.8, 0.9)
COPD/Never Smoker[b]	1.7 (1.6, 1.9)
COPD/Former Smoker[c]	1.5 (1.4, 1.6)
COPD/Current Smoker[d]	1.4 (1.3, 1.5)
	High blood pressure
No COPD/Never Smoker[b]	1.0 (referent)
No COPD/Former Smoker[c]	1.1 (1.1, 1.1)
No COPD/Current Smoker[d]	1.0 (1.0, 1.0)
COPD/Never Smoker[b]	1.4 (1.4, 1.5)
COPD/Former Smoker[c]	1.3 (1.2, 1.3)
COPD/Current Smoker[d]	1.2 (1.2, 1.3)
	High cholesterol
No COPD/Never Smoker[b]	1.0 (referent)
No COPD/Former Smoker[c]	1.1 (1.1, 1.2)
No COPD/Current Smoker[d]	1.1 (1.0, 1.1)
COPD/Never Smoker[b]	1.3 (1.3, 1.4)
COPD/Former Smoker[c]	1.3 (1.3, 1.4)
COPD/Current Smoker[d]	1.4 (1.4, 1.5)
	Kidney disease
No COPD/Never Smoker[b]	1.0 (referent)
No COPD/Former Smoker[c]	1.2 (1.1, 1.3)
No COPD/Current Smoker[d]	1.0 (0.9, 1.2)
COPD/Never Smoker[b]	2.5 (2.2, 2.9)
COPD/Former Smoker[c]	2.2 (1.9, 2.5)
COPD/Current Smoker[d]	2.8 (1.6, 2.1)
	Stroke
No COPD/Never Smoker[b]	1.0 (referent)
No COPD/Former Smoker[c]	1.4 (1.3, 1.5)
No COPD/Current Smoker[d]	1.5 (1.3, 1.6)
COPD/Never Smoker[b]	2.3 (2.0, 2.7)

COPD × Smoking Status	Chronic Disease Multivariable PR (95% CI)[a]
COPD/Former Smoker[c]	2.2 (1.9, 2.4)
COPD/Current Smoker[d]	2.9 (2.6, 3.2)

[a] Prevalence ratio (PR) and 95% confidence interval (CI) obtained from separate multivariable log-linear regression models for each chronic condition that included all possible combinations of COPD and status smoking categories as a predictor when entered simultaneously with age, gender, race/ethnicity, marital status, educational attainment, household income, and health insurance coverage as covariates.

[b] Respondents who smoked fewer than 100 cigarettes during their lifetime were considered never smokers.

[c] Respondents who smoked at least 100 cigarettes and reported smoking not at all at the time of interview were considered former smokers.

[d] Respondents who smoked at least 100 cigarettes and reported smoking every day or on some days at the time of interview were considered current smokers.